MC500

Network Time Server

User Manual

Version 1.3

worldtime
SOLUTIONS

SAFETY PRECAUTIONS

To reduce the risk of fire, or electric shock, ***DO NOT*** allow the MC500 to be exposed to rain or moisture.

To avoid the risk of electric shock, ***DO NOT*** open the enclosure.

This unit is designed to be installed into an equipment rack or on a suitable flat surface. ***DO NOT*** install this product on an uneven surface.

To prevent damage to the unit, clean ***ONLY*** with a dry cloth.

Use this product ***ONLY*** with the supplied power adapter. If the power adapter becomes damaged, consult a qualified electrician for advice.

The supplied power adapter is intended to serve as a disconnect device. The socket-outlet should be installed near the equipment and should be easily accessible.

CERTIFICATION

CE

In accordance with European Directives *2006/95/EC (The Low Voltage Directive)* and *2004/108/EC (The Electromagnetic Compatibility Directive)*, the MC500 is in conformity with the applicable requirements of *BS EN 60950-1:2006 (Information Technology Equipment - Safety)*, *BS EN 55022:2006 (Information Technology Equipment - Radio disturbance characteristics - class B)* and *BS EN 55024:2003 (Information Technology Equipment - Immunity characteristics)*.

A copy of the EC Declaration of Conformity is included at the rear of this user manual. Copies of the original document may be downloaded from our web site at:

`www.worldtimesolutions.com`

RoHS COMPLIANCE

World Time Solutions Limited works with it's suppliers to ensure all products comply with the Restriction of Hazardous Substances (RoHS) directive.

For further information, please visit our web site at:

`www.worldtimesolutions.com/rohs.html`

DISPOSAL

Please dispose of this unit properly. To minimize pollution and help protect the environment, this unit should be recycled.

For further information and/or to view a copy of the *World Time Solutions Limited Waste Electrical and Electronic Equipment Policy*, please visit our web site at:

`www.worldtimesolutions.com/recycle.html`

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To obtain further information and/or a copy of the software licence please visit:

`www.worldtimesolutions.com`

LIMITED WARRANTY

The MC500 Network Time Server is guaranteed against failure due to faulty parts or workmanship for a period of five (5) years from date of purchase.

In the event of product failure due to faulty parts or workmanship within the warranty period, World Time Solutions Limited, at its own discretion, will either (a) repair the product, (b) supply a replacement product, (c) supply a functionally equivalent replacement product, or (d) refund the purchase price of the product.

The limited warranty will not apply if (a) the product has not been installed or operated as per our instructions, (b) the product has been modified in anyway.

In the event of failure, the MC500 should be returned to the manufacturer for inspection and repair. Please visit our support pages for further details:

`www.worldtimesolutions.com/support.html`

TECHNICAL SUPPORT

To obtain help with the installation or operation of the MC500, please visit our web site at:

`www.worldtimesolutions.com/support.html`

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1 - Introduction

The World Time Solutions MC500 is a Network Time Server with an Ethernet port and an RS-232 serial output. The MC500 obtains time information from a connected antenna and uses this data to service NTP time requests from multiple devices on a TCP/IP network. The MC500 also provides RS-232 level time and date information and PPS (Pulse Per Second) data.

The MC500 is based around World Time Solutions proprietary software for enhanced security.

> What is NTP?
>
> Network Time Protocol (NTP) enables the synchronisation of computer clocks across data networks. It was originally proposed in the early 1980s and has been continually updated and used ever since.
>
> Further information may be found at the home of the NTP project:
>
> http://www.ntp.org

1.1 - Quick start guide

The following list of procedures can be used for rapid installation of the MC500:

- Install the MC500 into a 19" equipment rack or on a suitable surface *(see section 2.1).*
- Install and connect a suitable antenna system to one of the remote synchronisation inputs *(see section 2.2)*.
- Connect the MC500 to a suitable 100-240 VAC mains power supply via the supplied power adapter *(see section 2.3)*.
- Enter the required network address settings or set the MC500 for DHCP operation *(see section 3)*.
- Select the local time zone *(see section 4.1 & appendix D)*.
- Connect the MC500 to your TCP/IP Ethernet network via a network switch or hub *(see section 2.4)*.

The following optional procedure may also be performed:

- If required, configure the RS-232 serial time and date / PPS (Pulse Per Second) outputs.
- If required, connect the RS-232 serial port to a third-party device.

1.2 - Package contents

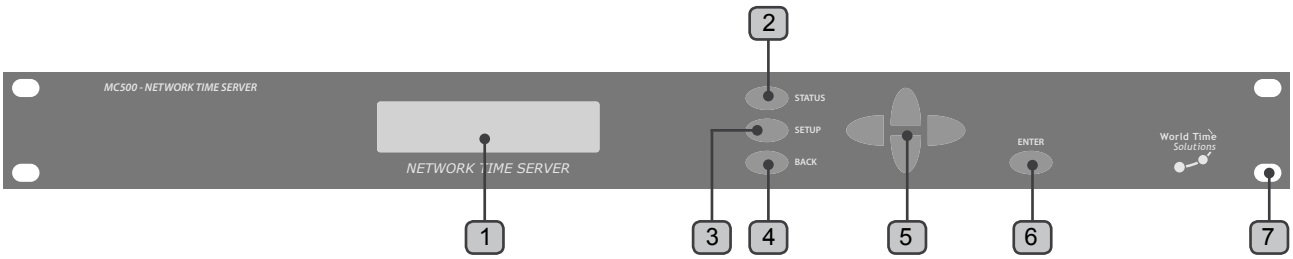
The MC500 is supplied with the following component parts:

- MC500 Network Time Server
- Power adapter
- CAT5 patch & RS-232 serial cables
- User manual

1.3 - Front & Rear drawings

The drawings below show the front and rear view of the MC500.

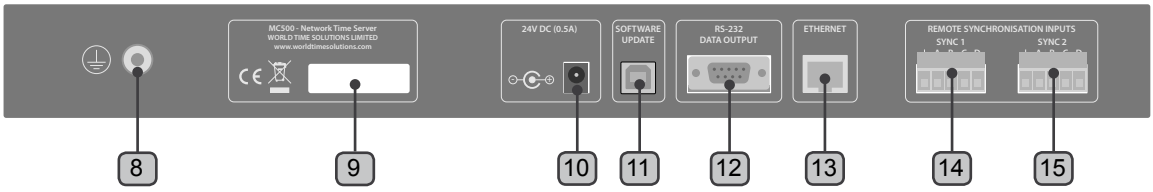
1.3.1 - MC500 front view



No.	Function	No.	Function
1	Liquid crystal display (LCD)	5	Multifunction switches
2	Status switch	6	Enter switch
3	Setup switch	7	Rack mounting ears
4	Back / Exit switch		

Table 1.1 - Front panel functions

1.3.2 - MC500 rear view



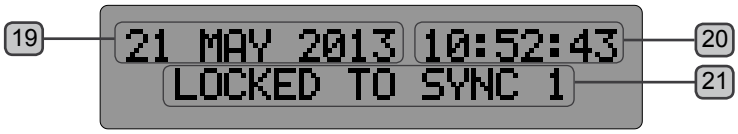
No.	Function	No.	Function
8	Earth point	12	RS-232 data / PPS output
9	Serial number / MAC address	13	Ethernet port
10	DC power inlet	14	Remote Synchronisation Port Sync 1 input
11	USB software update port	15	Remote Synchronisation Port Sync 2 input

Table 1.2 - Rear panel functions

1.4 - LCD time and status displays

In normal operation, the liquid crystal display (LCD) shows the local time and date and synchronisation status. The MC500 also has three status display screens accessible via the *'STATUS'* switch. The status display screens show basic information from the connected antenna systems and the status of the network interface.

1.4.1 - Standard time and date display



No.	Function	No.	Function
19	Local date	21	Synchronisation status
20	Local time		

Table 1.3 - Standard time and date display functions

1.4.2 - Sync 1 & Sync 2 status displays

The Sync 1 status display is accessible by pressing the 'STATUS' switch on the front panel. With a further press of the status switch, a similar Sync 2 status display is shown.

No.	Function	No.	Function
22	Antenna system type	23	Antenna status

Table 1.4 - Sync 1 status display functions

1.4.3 - Network status display

The Network status display is located after the two sync status display screens. This can be accessed by a further depression of the 'STATUS' switch. Press the status switch again to exit.

No.	Function
24	Network status

Table 1.5 - Network status display functions

2 - Installing the MC500

The MC500 is supplied in a robust metal case suitable for mounting into an industry standard 19” rack. The system is supplied with an external power adapter and also requires a connection to your local area network and connection to a compatible World Time Solutions Time Receiver System.

System setup should be performed using the front panel switches.

2.1 - Physical installation

The MC500 has been designed for installation into an industry standard 19” rack. The unit is 1U (44mm - 1.75”) high.

2.2 - Remote synchronisation input connections

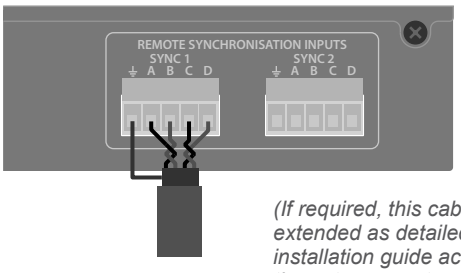
The MC500 has two remote synchronisation inputs for connection to compatible World Time Solutions Time Receiver systems. The MC500 is designed to operate with either one or two antenna systems connected. In installations using two antenna systems, the MC500 uses the second antenna as a live backup system.

2.2.1 - Installing the antenna system

The antenna system/s should be installed as specified in the accompanying installation guide.

2.2.2 - Connecting the antenna system to the MC500

The antenna system/s should be connected to one of the Remote Synchronisation Inputs using the supplied cable. Connections should be made as shown in the installation guide accompanying the antenna system. Please also refer to the antenna installation guide for details of how the cable may be extended.



(If required, this cable may be extended as detailed in the installation guide accompanying the antenna system.)

2.2.3 - Antenna system setup and status

The MC500 monitors the status of any connected antennae and automatically selects the most stable and accurate as a synchronisation reference source.

All compatible World Time Solutions Time Receiver systems incorporate setup information into data messages sent to the MC500. This setup information is used by the MC500 to perform any required setup changes automatically. Therefore, new or different antenna systems can be connected to the MC500 in the future without any programming changes by the user.

Detailed information regarding antenna synchronisation status may be obtained via the sync status screens *(see section 1.4.2)*.

2.3 - Power connection

The MC500 is supplied with an external power adapter. The power adapter should be connected to the MC500 before being connected to a local mains power supply.

2.4 - Local area network connection

PLEASE NOTE: In order to prevent possible network setup conflicts, it is recommended that the MC500 is not connected to the network before the Network Setup Procedure in section 3 has been completed.

The MC500 should be connected to an Ethernet switch/hub on a TCP/IP network. The MC500 has a 10BASE-T/100BASE-TX auto-sensing Ethernet port and should be connected to the network using the supplied CAT5 patch cable (or similar).

2.5 - RS-232 output

The MC500 has an RS-232 data output providing user programmable serial time and date messages and PPS (Pulse Per Second) data. Please refer to section 4 for connection and setup details.

2.6 - Earth connection

To ensure compliance with the relevant Electromagnetic Compatibility, Radio disturbance and Immunity standards, the MC500 should be connected to a suitable earthing point using the rear Earth binding post.

3 - Network setup

The Ethernet port enables the MC500 to be connected to a TCP/IP network via an Ethernet switch or hub *(see section 2.4)*.

The network interface may be programmed to operate with DHCP enabled or disabled. When DHCP operation is enabled, the MC500 attempts to obtain network address settings automatically from a DHCP server on the network. With DHCP disabled, network address settings are manually entered into the unit.

What is DHCP?

Dynamic Host Configuration Protocol (DHCP) enables the automatic assignment of IP address settings on a TCP/IP network.

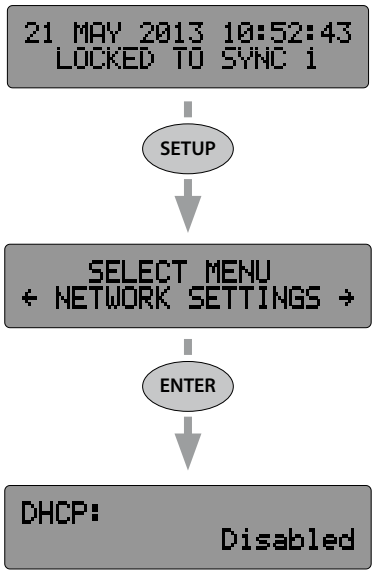
Upon connection to a TCP/IP network, a client device configured for DHCP operation communicates with the DHCP server and obtains an IP address lease.

The DHCP protocol is defined in RFC 2131, available for download from:

http://www.rfc-editor.org

3.1 - How to enter the network setup menu

The network setup menu can be accessed using the front panel switches as shown in the graphic below:



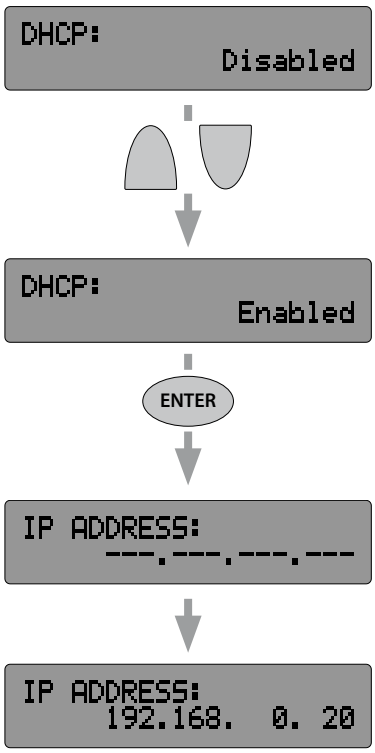
3.2 - Changing the DHCP setting

As shown in the graphic on the following page, with the MC500 in the network setup menu and the DHCP option screen displayed, pressing either the *'UP'* or *'DOWN'* switches will toggle the DHCP mode. When the correct mode has been selected, pressing the *'ENTER'* switch will forward on through the remaining network setup menu options.

If DHCP is enabled, the remaining network setup screens will show the IP settings obtained from the DHCP server. If the MC500 has not yet obtained a DHCP lease, the IP address, subnet and gateway screens will show '---.---.---.---' in place of a valid network address.

The status of the network connection may be confirmed by displaying the network status screen *(see section 1.4.3)*.

From this point, the network setup menu may be exited by a further four presses of the *'ENTER'* switch.



IP address screen before a DHCP lease is obtained.

IP address screen after a DHCP lease is obtained.

3.3 - Programming static IP settings.

If DHCP operation is disabled, the MC500 uses the IP address, subnet and gateway address as programmed in the network setup menu.

The IP settings can be adjusted using the multi-function switches. Pressing the *'ENTER'* switch will move on to the next screen.

3.4 - NTP Broadcast

In a typical computer network, NTP operates in Unicast mode*: an NTP client requests the time and the MC500 NTP server responds directly to this request*. However, in certain applications, it may be desirable to configure the MC500 to operate in broadcast mode.

When operating in NTP broadcast mode, as well as responding directly to Unicast NTP requests, the MC500 additionally broadcasts NTP messages to all devices on the local subnet. Broadcast messages are transmitted every 64 seconds.

4 - RS-232 output

The RS-232 data output provides time and date information at RS-232 signal levels. The data format can be chosen by the user from a list of more than 20 different formats.

The RS-232 port also outputs high accuracy PPS (pulse per second) data at RS-232 signal levels.

4.1 - Connecting to the RS-232 output

The MC500 has a female DB-9 (DE-9) D-Sub (DTE) connector. Table 4.1 shows the pin connections.

Pin	Signal	Source	Description
1	PPS	Output	Pulse Per Second
2	TXD	Output	Transmitted data
3	RXD	Input	Received data
5	GND	Input	Signal ground
4, 6 - 9	unused	-	-

Table 4.1 - RS-232 serial port pin connections

4.2 - RS-232 data message format

Serial data is transmitted in one of more than 20 ‘message formats’. Available message formats are listed in appendix B.

The message format can be adjusted in the RS-232 output setup menu *(as shown in the diagram on page 10)*.

4.3 - RS-232 transmission parameters

RS-232 messages can be transmitted at various different baud rates and with different numbers of data bits, stop bits and parity settings. All of these parameters can be adjusted by the user via the RS-232 output setup menu *(shown in the diagram on page 10)*. Table 4.2 lists the available transmission parameters.

RS-232 data messages are transmitted aligned with the second edge. The MC500 can be user-programmed to output an RS-232 data string every second, or periodically *(as detailed in table 4.2)*.

When set to the ‘on demand’ repetition rate, the MC500 will only output serial data on receipt of a valid transmission request character. Valid characters are ‘s’ (0x73), ‘S’ (0x53), ‘t’ (0x74), ‘T’ (0x54) and ‘?’ (0x3f). The data transmission starts on the second edge after a valid request character has been received.

4.4 - RS-232 time zone

As standard, the MC500 transmits RS-232 time and date information referenced to the local time zone *(please refer to chapter 5 for further details)*. If required, RS-232 data can be referenced to UTC by adjusting the 'RS-232 time zone' in the RS-232 output setup menu *(as shown on page 10)*.

RS-232 Output Menu Option	Description Of Function	Available options
Message format	Format of RS-232 data messages.	Please refer to appendix B
Baud rate	Data transmission speed (bits per second)	1200, 2400, 4800, 9600, 19200
Data bits	Number of data bits	7, 8
Parity	Error checking	none, odd, even
Stop bits	Number of stop bits	1, 2
Repetition rate	Time period between message transmissions	1 sec, 1 min, 5 mins, 1 hr, 24 hours (at 00:00), 24 hours (at 03.30), on demand
RS-232 time zone	Time & date to which the RS-232 output is referenced	local, utc
PPS output polarity	The polarity of the PPS output pulse	standard, inverted, disabled
PPS pulse width	Length of each PPS pulse	20 msec, 100 msec, 200 msec

Table 4.2 - RS-232 output menu options

4.5 - PPS (pulse per second) output

PPS (pulse per second) data is available on pin 1 of the RS-232 output port. When enabled, the PPS pin provides a short pulse every second, aligned with the second edge. PPS data is transmitted at RS-232 signal levels.

When set to standard output polarity, the pin is normally at a negative voltage level (RS-232 logic state 1). At the start of the second edge, the pin switches to a positive voltage level (RS-232 logic state 0). After the PPS pulse has ended, the pin switches back to a negative voltage level.

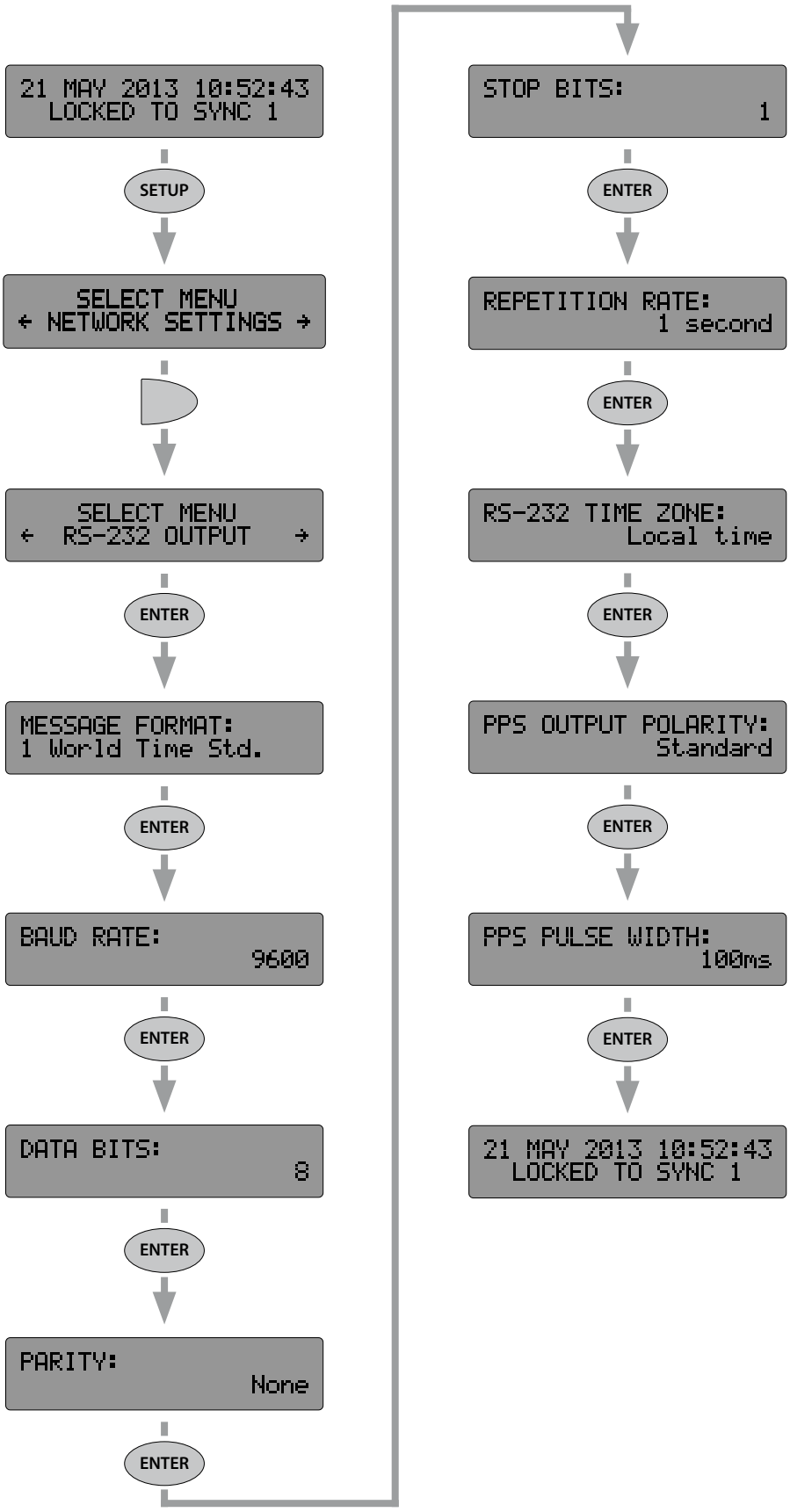
When set to inverted operation, pin polarity is the opposite of standard operation (normally held at logic state 0, switching to logic state 1 at the second edge).

The width of the PPS pulse may be adjusted from 20 msec to 200 msec.

Please refer to the diagram on page 10 for details of adjusting these parameters.

4.6 - Configuring the RS-232 / PPS output

The RS-232 output configuration menu can be accessed using the front panel switches as detailed below:



5 - Setting the time zone

What is UTC?

In the early 1970s, with the increase in timing accuracy made available by modern atomic clocks, Coordinated Universal Time (UTC) replaced Greenwich Mean Time (GMT) as the world's time scale.

Historically, GMT calculated the length of a day based on solar time patterns. UTC uses highly accurate atomic clocks as a calculation base.

See also... 'What is a leap second?' (section 6).

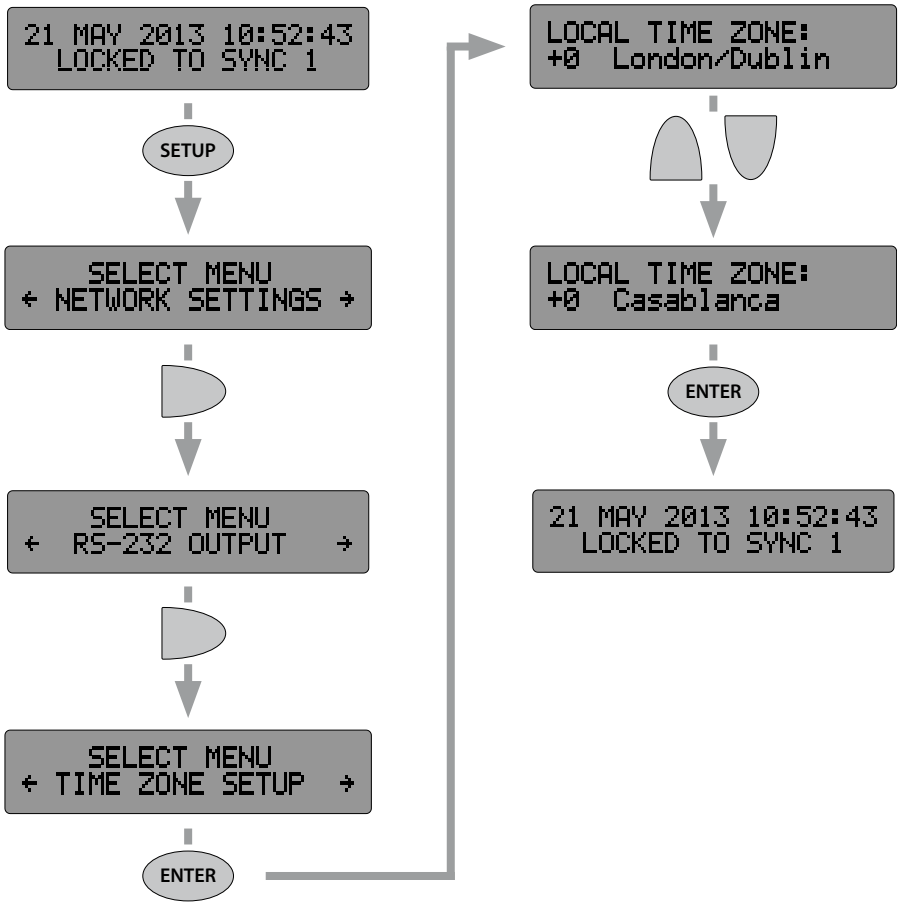
The MC500 maintains a time count for both UTC *(see side panel for further details)* and local time. The UTC count is used as a reference for NTP (Network Time Protocol) time stamps. The local time count is shown on the LCD display (enabling simple user-monitoring of time accuracy) and is normally used as a reference for the RS-232 data output *(in certain applications, the user may wish to reference RS-232 data to the UTC time count - refer to chapter 4 for further details)*.

As part of the initial setup procedure, the user should select the local time zone from a preprogrammed list. Where applicable, the preprogrammed time zones incorporate seasonal time change information, allowing changes to occur automatically.

Appendix D lists the preprogrammed time zones along with offsets from UTC. The time zone may be adjusted following the procedure detailed below.

4.1 - Setting the local time zone

The local time zone should be adjusted as shown in the diagram below. Once the local time zone screen is displayed, the selected time zone can be adjusted using either the *'UP'* or *'DOWN'* multi-function switches. Please refer to appendix D for details of available preprogrammed time zones.



6 - Advanced setup

The Advanced Setup menu contains various settings, most of which typical users should not need to access or adjust. Settings may be adjusted following the procedure detailed in section 6.1 below.

The table below details the options in the Advanced Setup menu:

Advanced Setup Menu Option	Description Of Function
Set local time	Allows local time to be adjusted. This should only be adjusted if the MC500 has no active remote synchronisation reference. Note that before adjusting this setting, the time zone must be programmed *(see section 5.1)*.
Set local date	Allows local date to be adjusted. This should only be adjusted if the MC500 has no active remote synchronisation reference. Note that before adjusting this setting, the time zone must be programmed *(see section 5.1)*.
Leap second	Enables the user to manually set a positive (1 second added) or negative (1 second removed) leap second *(see side bar)*. If programmed, the leap second will occur once only at the end of the following June or December (which ever occurs first) and then be erased.
Display contrast	Allows adjustment of liquid crystal display contrast to aid viewing at different angles.
Display power save	When enabled, switches off liquid crystal display backlight if switches have not been active for 2 mins.
Serial number	MC500 serial number. *(Read only)*
MAC address	Media Access Control address. *(Read only)*
Software version	Current software version. *(Read only)*
Hardware version	MC500 build revision. *(Read only)*
SYNC 1 software	SYNC 1 software version. *(Read only)*
SYNC 1 hardware	SYNC 1 build revision. *(Read only)*
SYNC 2 software	SYNC 2 software version. *(Read only)*
SYNC 2 hardware	SYNC 2 build revision. *(Read only)*
Language	Current language.

Table 6.1 - Advanced Setup menu options

What is a leap second?

The average rotational speed of the earth is very slowly decreasing and therefore the average length of a solar day is very slowly increasing.

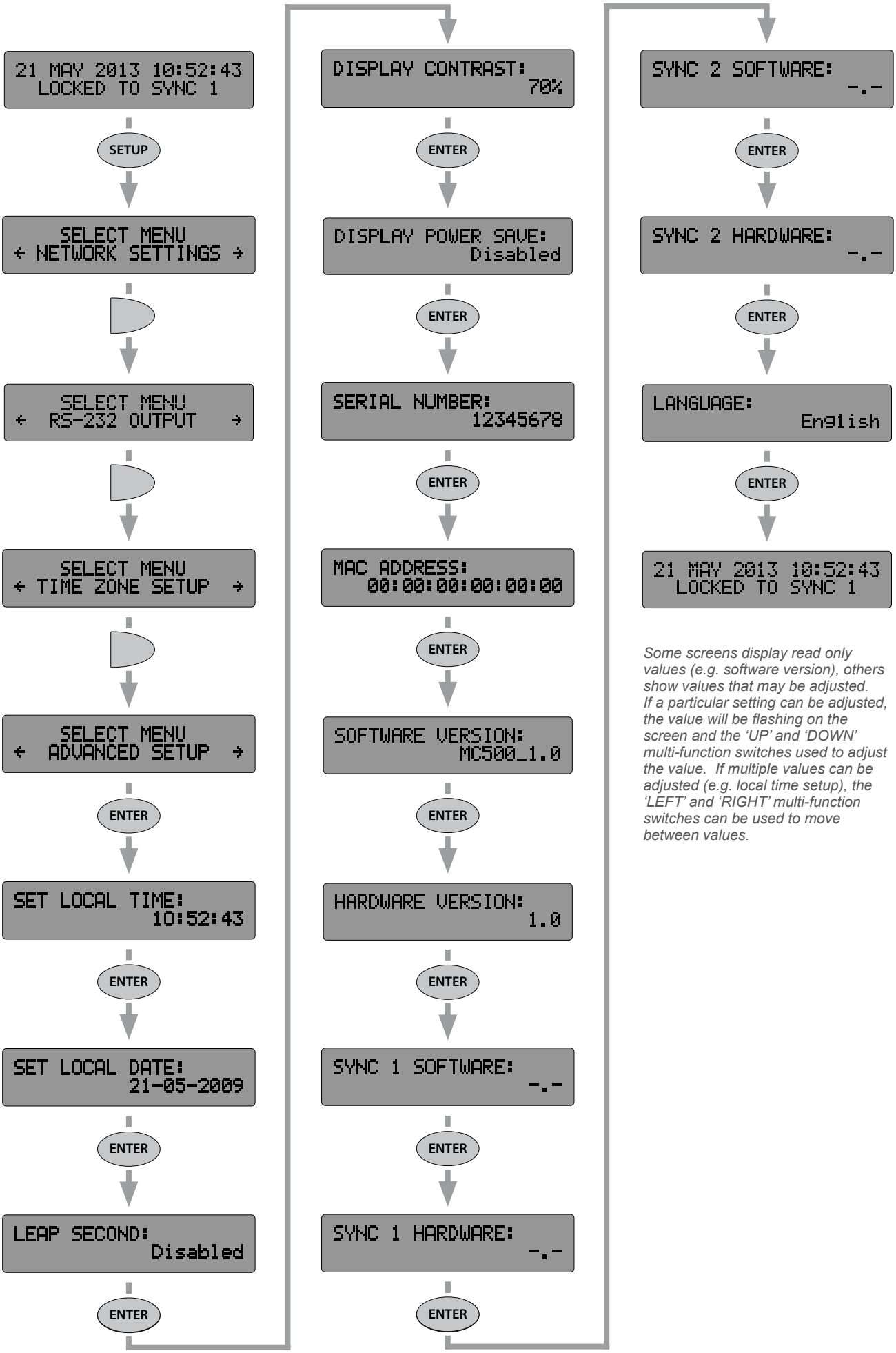
To enable time counts based on solar day observations to be kept in alignment with international time scales, an extra second is occasionally added to UTC at the end of June or December.

Assuming the MC500 is connected to a leap second capable antenna system, leap seconds will be handled automatically, with the leap second setting (found in the Advanced Setup menu) being adjusted up to one month in advance of the event.

See also... 'What is UTC?' (section 5).

6.1 - Accessing advanced setup

The advanced setup configuration can be confirmed using the procedure shown in the diagram on the following page.



Some screens display read only values (e.g. software version), others show values that may be adjusted. If a particular setting can be adjusted, the value will be flashing on the screen and the 'UP' and 'DOWN' multi-function switches used to adjust the value. If multiple values can be adjusted (e.g. local time setup), the 'LEFT' and 'RIGHT' multi-function switches can be used to move between values.

7 - Software updates

Occasionally, an updated software version may become available for the MC500. The updated software should be installed using the MC500 Software Update Utility.

The MC500 Software Update Utility and any available software updates can be downloaded from the World Time Solutions web site:

`http://www.worldtimesolutions.com`

7.1 - Downloading the Software Update Utility

PLEASE NOTE: The Software Update Utility should be downloaded and the USB drivers installed prior to connecting the MC500 to the PC.

The following procedure should be performed on a *Microsoft® Windows® XP SP3, Windows Vista™ or Windows® 7* PC:

- Visit the World Time Solutions web site and navigate to the MC500 downloads page.
- Right click the MC500 Software Update Utility and select 'Save link as...'
- Select a directory on your computer.

For troubleshooting advice, please refer to appendix A.

7.2 - Installing the Software Update Utility

- Navigate to the directory with the MC500 Software Update Utility *(previously downloaded in section 7.1 above)*.
- Right click the MC500 Software Update Utility zip file and select 'Extract All...'
- Follow the instructions on screen to extract the zip file to a new directory.
- Navigate to the new directory and double click the utility installer MC500_Utility_Installer.exe. *(If an 'Open File - Security Warning' appears, select 'Run' to continue installation.)*
- In the MC500 Utility Installer window, click 'Install USB Drivers'.
- Once the USB drivers have been installed, connect the MC500 to the PC using a standard USB printer cable.
- In the MC500 Utility Installer window, click 'Install MC500 Software Update Utility'. The MC500 Software Update Utility will start automatically.

For troubleshooting advice, please refer to appendix A.

7.3 - Downloading the updated software version

- Visit the World Time Solutions web site and navigate to the MC500 downloads page.
- Right click the new MC500 software version and ‘Save link as...’
- Select a directory on your computer.

For troubleshooting advice, please refer to appendix A.

7.4 - Applying a software update

- Navigate to the directory with the new MC500 software version *(previously downloaded in section 7.3 above)*.
- Right click the new software zip file and select ‘Extract All...’
- Follow the instructions on screen to extract the zip file to a new directory.

The remaining steps are performed using the MC500 Software Update Utility.

- In the section labelled *‘Software Version’* the current software version is shown. Click the *‘Browse’* button. A *‘File Open’* window will appear.
- Select the recently downloaded and extracted file *(MC500T_x.x)* and click *‘Open’*. The new file version will now be displayed in the *‘Replacement Software Version’* text box.
- Click the *‘Start Update Procedure’* button. The replacement software will now be uploaded into the MC500 via the USB connection. The ‘Software Update Progress’ section details the procedures being performed and overall progress.
- Once the update is complete, click on the ‘Exit’ button.

For troubleshooting advice, please refer to appendix A.

A - Troubleshooting

Problem	Possible Cause	Solution
Time synchronisation error	Antenna not synchronised	Check sync status screen *(see section 1.4)*
		Refer to antenna user guide
	Cabling fault	Refer to antenna user guide *(and section 2.2.2)*
Not responding to NTP requests	No connection to network	Check connection to network switch/hub
		Check CAT5 patch cable integrity
	MC500 time not set	Refer to Time synchronisation error section above
		If not using an antenna system, manually set local time and date *(see section 6)*
'MC500 not found' error displayed in MC500 Software Update Utility	MC500 USB interface not detected by Software Update Utility at startup	Check USB connection between MC500 & PC *(see section 7)*
		Check USB cable *(see section 7)*
'Communication failure' error displayed in MC500 Software Update Utility	Unspecified comms error between MC500 and PC	Check USB connection between MC500 & PC *(see section 7)*
		Check USB cable *(see section 7)*
'USB data error' displayed in MC500 Software Update Utility	Error checking failure between MC500 and PC	Check USB connection between MC500 & PC *(see section 7)*
		Check USB cable *(see section 7)*
Liquid crystal display hard to read	Contrast set incorrectly	Adjust LCD contrast *(see section 6)*
Liquid crystal display backlight switching off automatically	LCD power save mode enabled	Disable LCD power save mode *(see section 6)*
RS-232 output not functional	RS-232 output configured incorrectly	Check all RS-232 output settings *(see section 4)*
PPS output not working as expected	PPS output configured incorrectly	Check PPS settings *(see section 4)*

Table A.1 - Troubleshooting guide

B - RS-232 message formats

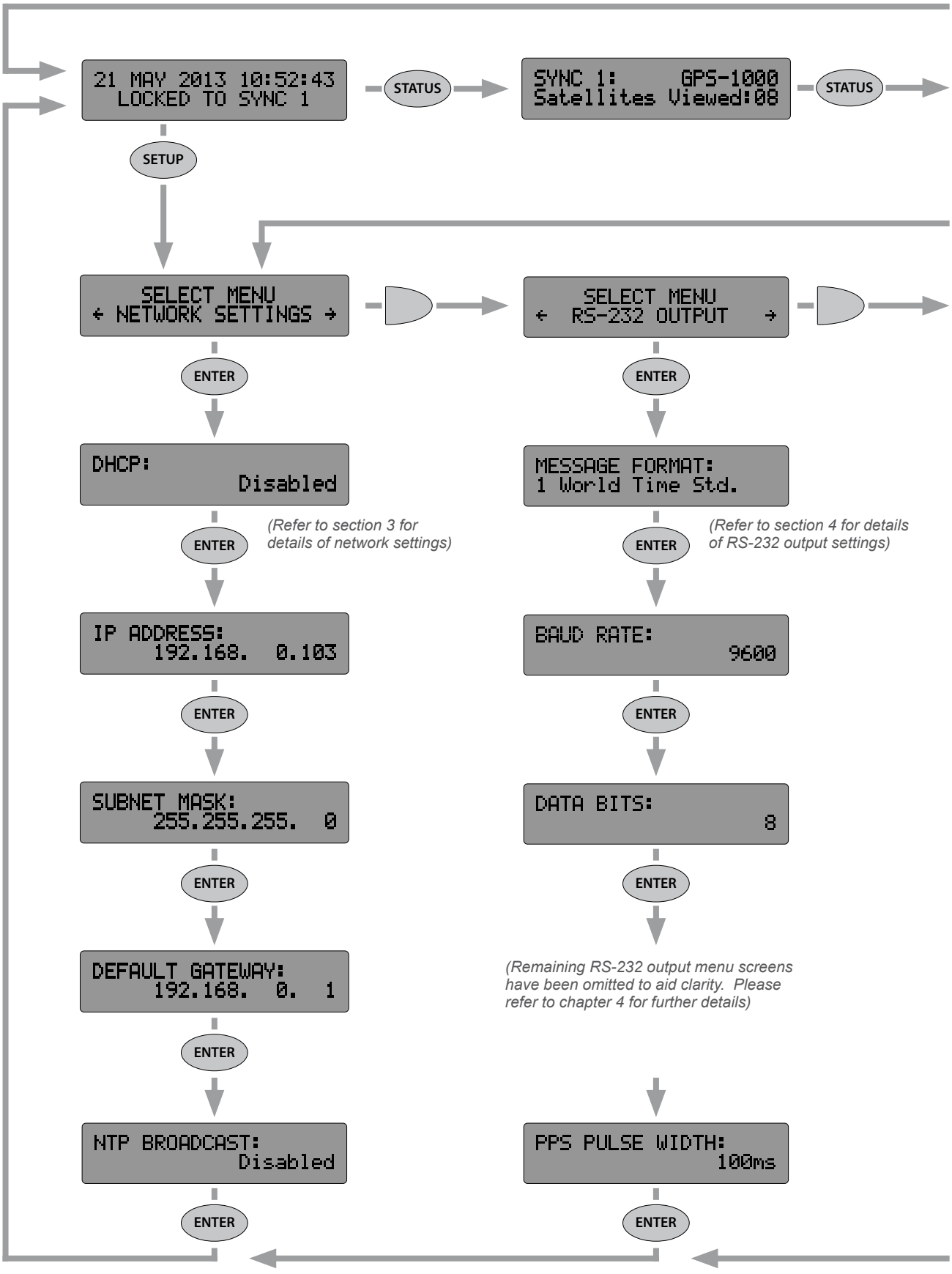
The table below lists the RS-232 message formats. Please refer to chapter 4 for further details.

No.	Message format	Notes
1	World Time Solutions standard format	
2	World Time Solutions long format	
3	World Time Solutions short format	
4	NMEA GGA	
5	NMEA RMC	
6	NMEA ZDA	
7	Spectracom NetClock/2 format 0	
8	Spectracom NetClock/2 format 1	
9	Spectracom NetClock/2 format 2	
10	Spectracom NetClock/2 format 3	
11	Spectracom NetClock/2 format 4	
12	EES M100	
13	EES M201	
14	Meinberg Standard time string	
15	Computime Time String	
16	Sysplex 1	
17	Wtn. format 1	
18	Wtn. format 1 (without status)	
19	Wtn. format 2	
20	Wtn. format 2 (with day of week)	
21	Racal XGU	
22	Tecton Darlex	(03:30 & 03:31 only)
23	TAIP AL (Altitude / Vertical Velocity)	
24	TAIP CP (Compact Position)	
25	TAIP LN (Long Navigation)	
26	TAIP PV (Position / Velocity)	
27	TAIP TM (Time / Date)	

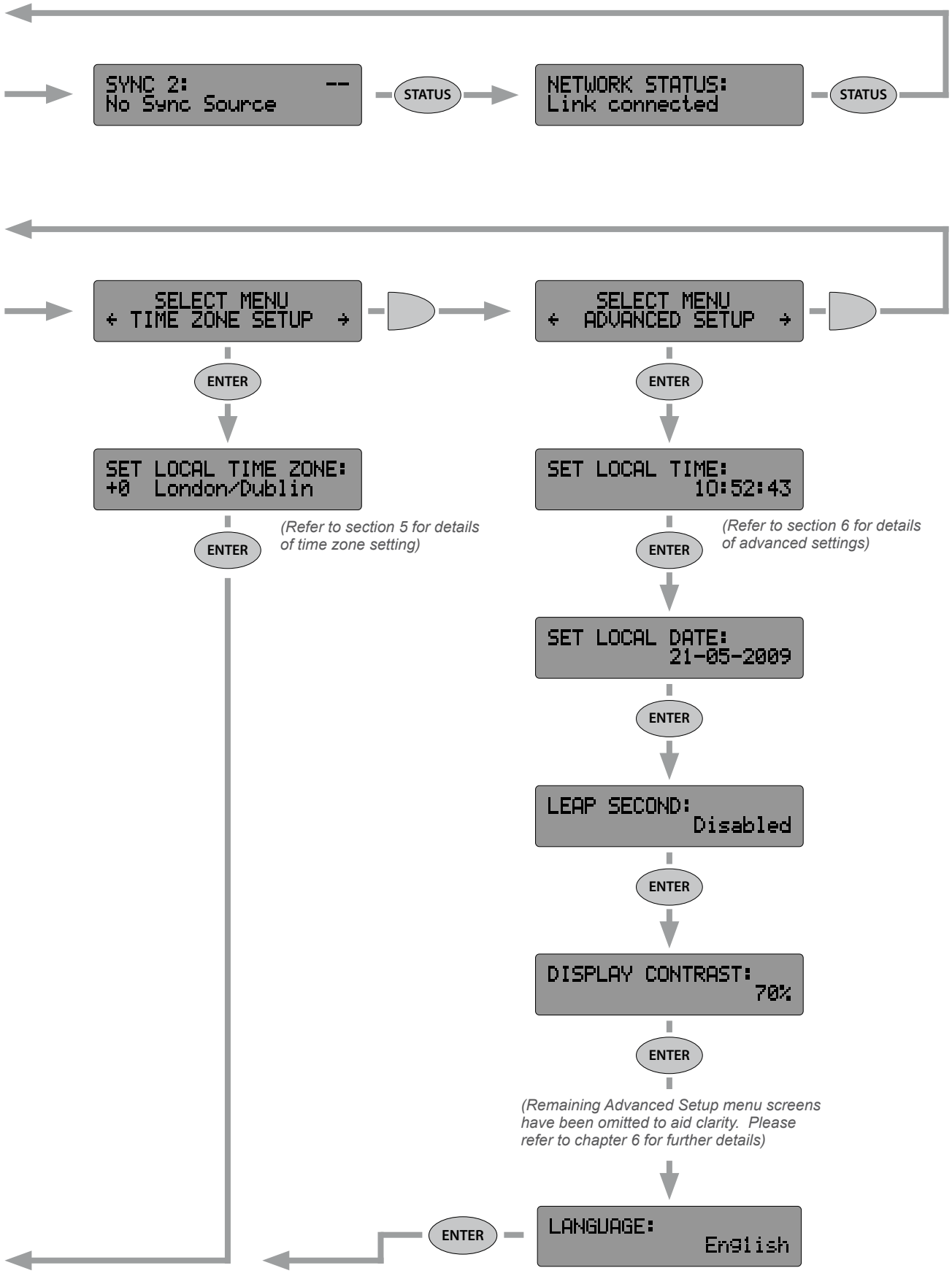
Table B.1 - RS-232 message formats

C - Menu structure

The flow diagram below shows the basic structure of the MC500 programming menu.



PLEASE NOTE: Some detail has been omitted from this diagram to aid clarity.



D - Time zones

The table below lists the preprogrammed time zones. Time zone offsets followed by a * character indicates that the time zone has daylight saving changes.

UTC Offset	City / Time Zone
0	UTC/Reykjavik
0*	London/Dublin/Lisbon
0*	Casablanca
+1	Lagos/Algiers
+1*	CET/Paris
+2	Cape Town/Johannesburg/Harare
+2*	Athens/Sofia
+2	Cairo
+2*	Jerusalem
+2*	Beirut
+2*	Amman
+3	Khartoum/Nairobi/Baghdad
+3*	Moscow (old)
+3.5*	Tehran
+4	Dubai/Moscow
+4.5	Kabul
+5	Karachi
+5.5	Mumbai/New Delhi
+5.75	Kathmandu
+6	Almaty/Dhaka
+6.5	Yangon
+7	Bangkok/Jakarta
+8	Singapore/Hong Kong/Beijing
+8*	Perth
+9	Seoul/Tokyo
+9.5	Darwin
+9.5*	Adelaide
+10	Brisbane
+10*	Vladivostok
+10*	Melbourne/Canberra/Sydney
+11	-
+12	Suva
+12*	Kamchatka/Anadyr
+12*	Auckland
+12.75*	Chatham Island
+13	-
+14	Kiritimati

Table D.1 - Preprogrammed Time Zones

UTC Offset	City / Time Zone
-10	Honolulu
-9	-
-9*	Anchorage
-8	-
-8*	Vancouver/San Francisco
-7	Phoenix
-7*	Edmonton/Denver
-6	Guatemala/San Salvador/Managua
-6*	Winnipeg/Houston/Chicago
-6*	Mexico City
-5	Lima/Kingston/Bogota
-5*	New York/Toronto/Nassau
-5*	Havana
-4.5	Caracas
-4	Santo Domingo/La Paz/San Juan
-4*	Halifax
-4*	Santiago
-3.5*	Newfoundland
-3	-
-3*	Brasilia/Sao Paulo
-3*	Montevideo
-3	Buenos Aires
-2	-
-1	-

Table D.1 - Preprogrammed Time Zones (cont..)

E - Specifications

Typical Performance Specifications	
Synchronised internal timing accuracy:	Dependent on synchronisation source accuracy, time elapsed from first lock and cable lengths. Typically within 100nsec of synchronisation source after 30 mins.
NTP/SNTP Client synchronisation accuracy:	Dependent on network architecture, utilisation, delays and jitter. Clients typically synchronised to within 200 µsec to 2 msec of MC500 on a local area network.
RS-232 output accuracy:	50 µsec
PPS output accuracy:	1 µsec
PPS output jitter:	100 nsec

Supported Protocols
NTP v2 (RFC 1119), NTP v3 (RFC 1305), NTP v4 (no RFC), SNTP v3 (RFC 1769), SNTP v4 (RFC 2030), DHCP

I/O Connections	
Ethernet:	10BASE-T / 100BASE-TX auto-sensing
RS-232 / PPS:	DB-9 (DE-9) female D-Sub (DCE)
Software update:	USB Specification 2.0 compliant full-speed (12 Mbit/s)
Synchronisation inputs:	2 x dual-redundant 1000 series antenna connection ports
Power input:	24 VDC power input, supplied with external power adapter

Mechanical & Electrical Specifications	
Dimensions:	483 x 44 x 120 mm (19.0” x 1.73” x 4.72”)
Weight:	2 kg
Power consumption:	0.5 AMPS (@ 24 VDC)

Environmental Specifications	
Operating temperature:	0 to 50 ºC
Relative humidity:	0% - 95%, noncondensing

Standards	
Electrical Safety:	BS EN 60950-1:2006
Radio Disturbance:	BS EN 55022:2006 (class B)
Immunity Characteristics:	BS EN 55024:2003

F - Certificate of Conformity

World Time Solutions

EC Declaration of Conformity

We World Time Solutions Limited
of 6 Clinton Crescent, Aylesbury, Buckinghamshire, HP21 7JW, UK

in accordance with the following Directives:

2006/95/EC	The Low Voltage Directive
2004/108/EC	The Electromagnetic Compatibility Directive

hereby declare that:

Equipment:	Network Time Server
Model number:	**MC500**

is in conformity with the applicable requirements of the following documents:

Ref. No.	Title	Edition / Date
BS EN 60950-1	Information Technology Equipment - Safety	2006
BS EN 55022	Information Technology Equipment - Radio disturbance characteristics (class B)	2006
BS EN 55024	Information Technology Equipment - Immunity characteristics	2003

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The system complies with all applicable Essential Requirements of the Directives.

Signed:

CE 13

Name:	Anthony Honeyball
Position:	Managing Director
Date:	29th July, 2013

Ref: WTSCF2013/01

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